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**PLAIN ORDINARY TELEPHONE LINE AND LOCAL AREA NETWORK
CONNECTIONS FOR MOBILE PHONES**

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1 **PLAIN ORDINARY TELEPHONE LINE AND LOCAL AREA NETWORK**
2 **CONNECTIONS FOR MOBILE PHONES**

3
4 **Technical Field**

5 The present invention generally relates to mobile and computer communication.
6 More particularly the present invention relates to providing plain ordinary telephone line and
7 local area network communication capabilities in wireless communication devices.
8

9 **Background Art**

10 In the recent years, with a society which is becoming increasingly mobile, and with
11 the ever-increasing need for communications, wireless communication services, particularly
12 mobile or cellular phone services, have gained wide popularity. Use of a mobile phone has
13 now become an ubiquitous part of the modern society.

14 Since their introduction, mobile phone handsets nowadays provide many
15 enhancement features, which may include, *e.g.*, a telephone number directory database, caller
16 identification, voice activated and/or speed dialing. The enhancement features provide much
17 more convenient and faster ways in which a call can be made.

18 Unfortunately, however, the conventional mobile phone handsets suffer from many
19 shortcomings that prevent a user from taking full advantage of the enhancement features,
20 particularly when the user has a ready access to a land-line telephone service --also referred
21 to as a plain ordinary telephone (POT) service, *e.g.*, through conventional wired public
22 switched telephone network (PSTN). For example, when the mobile phone user is in an
23 office, home or otherwise near a POT device, the mobile phone user typically prefers to use
24 the POT service offered at much cheaper rate rather than the mobile phone service, for which
25 the user may have to pay much higher rate. In this case, the user is typically required to
26 juggle two different telephone devices, *e.g.*, to obtain a telephone number from the directory
27 in the mobile phone handset, and to use the POT device to actually dial and make a call. It is
28 desirable to allow a user of a mobile phone handset to utilize the enhancement features of the
29 mobile handset even when the user is making a call through the POT network.

Moreover, more recently, mobile phone handsets have become "web enabled". That is, a user of a web enabled mobile phone handset may access the Internet, *e.g.*, the electronic mail (e-mail) system and the world-wide web (WWW) through a wireless communication network, using in particular the wireless application protocol (WAP). However, because of the size and/or weight constraint, the mobile phone handsets do not offer a convenient and practical user interface. It would thus be desirable to provide a better user interface means when a user is accessing the Internet through a mobile phone handset.

Furthermore, it would be desirable to provide a mobile telephone handset a capability to connect to various devices, *e.g.*, a global positioning system device, computing devices (*e.g.*, personal digital assistants (PDA), personal computers or the like), and even to a local area network, which may provide a more cost effective access to the Internet than the wireless communication network.

Thus, there is a need for a mobile phone handset capable of being utilized over a plain ordinary telephone line, and which is capable of communicating with various computing devices and networks.

Summary of Invention

In accordance with the principles of the present invention, a mobile phone handset comprises a connector configured to connect the mobile phone handset to at least one of a plain ordinary telephone line, a local area network and one or more computing devices.

In accordance with another aspect of the principles of the present invention, a method of mobile communication comprises providing a mobile phone handset having a connector configured to connect the mobile phone handset to at least one of a plain ordinary telephone line, a local area network and one or more computing devices, and allowing a user to operate the mobile phone handset utilizing at least one of connected ones of the at least one of a plain ordinary telephone line, a local area network and one or more computing devices.

Description of Drawings

Features and advantages of the present invention will become apparent to those skilled in the art from the following description with reference to the drawings, in which:

1 Figure 1 shows an exemplary embodiment of the mobile telephone handset capable of
2 connecting to, and capable of being operable through, an ordinary telephone line in
3 accordance with the principles of the present invention;

4 Figure 1A shows an exemplary embodiment of the mobile telephone handset capable
5 of connecting to, and capable of being operable through, a local area network in accordance
6 with the principles of the present invention;

7 Figure 1B shows an exemplary embodiment of the mobile telephone handset capable
8 of connecting to, and capable of being operable through, an ordinary telephone line and/or a
9 local are network in accordance with the principles of the present invention;

10 Figure 1C shows an alternative exemplary embodiment of the mobile telephone
11 handset capable of connecting to, and capable of being operable through, an ordinary
12 telephone line and/or a local are network shown in Fig. 1B;

13 Figure 2 shows an exemplary embodiment of the multi-purpose connection adaptor
14 shown in Fig. 1C, and in accordance with the principles of the present invention; and

15 Figure 3 shows a flowchart illustrative of an exemplary embodiment of the operation
16 process of the mobile phone handset in accordance with the principles of the present
17 invention.

18 **Detailed Description of Preferred Embodiments**

19 For simplicity and illustrative purposes, the principles of the present invention are
20 described by referring mainly to an exemplary embodiment thereof, particularly with
21 references to an example in which specific circuit block arrangement of the mobile phone
22 handset is describe. However, one of ordinary skill in the art would readily recognize that the
23 same principles are equally applicable to, and can be implemented in, any other circuit block
24 arrangements and configurations thereof, and that any such variation would be within such
25 modifications that do not depart from the true spirit and scope of the present invention.

26 In accordance with the principles of the present invention, a mobile phone handset has
27 incorporated connectors and/or circuitries to connect to plain ordinary telephone (POT) lines,
28 various computing devices and/or a local area network (LAN), *e.g.*, an Ethernet network
29

1 through a RJ-45 type connection. The POT line connection, e.g., a RJ-11 type connection,
2 and the relevant circuitries allow a user of the mobile phone handset to utilize many
3 convenience enhancement features of the mobile phone handset while at the same time taking
4 advantage of the cheaper rate in making a telephone call over the POT line. In addition, the
5 LAN connections and the connections to other computing devices allow the user to access the
6 Internet (e.g., the e-mail network and/or the world-wide-web (WWW)) at a cheaper rate than
7 the wireless access to the Internet, and may provide a better user interface.

8 In particular, Fig. 1 shows an exemplary embodiment of the mobile telephone handset
9 **100** capable of connecting to, and capable of being operable through, an ordinary telephone
10 line in accordance with the principles of the present invention. The mobile phone handset
11 **100** may comprise various conventional mobile phone components, which may include: a
12 telephone subsection **101**, a processor/control subsection **102**, a user interface **103**, a storage
13 memory **104**, a radio frequency (RF) subsection **105** and RF transmission/receiver (Tx/Rx)
14 subsection **106**, all of which are typically included in a conventional mobile phone handset as
15 known to those familiar with conventional mobile phone handsets. Briefly, as is known to
16 those having ordinary skill in the art, the conventional telephone subsection **101**, under
17 control of the processor/control subsection **102**, converts user voice to electrical signals to be
18 sent to the RF subsection **105** and to convert electrical signals received from the RF
19 subsection **105** into voice that can be heard by the user, and may include microphone(s) (not
20 shown), speaker(s) (not shown), transducer(s) (not shown), tone generator(s) (not shown) or
21 the like necessary to carry out the conversions. The RF subsection **105** converts the electrical
22 signals received from the telephone subsection **101** into RF signals, which is sent to a base
23 station (BS) of a mobile or wireless communication network by the Tx/Rx subsection **106**
24 and through the antenna **109**. In addition, the RF subsection **105** converts RF signals
25 received from the base station via the antenna **109** and the Tx/Rx subsection **106** to electrical
26 signals to be processed by the telephone subsection **101**.

27 A conventional mobile phone handset typically includes a user interface **103**, which
28 may comprise a keypad to allow a user to enter phone numbers, initiate mobile call and/or
29 access a directory database stored in a memory **104**. The user interface **103** typically also

1 includes a display (not shown), *e.g.*, a liquid crystal display (LCD) to allow the user to view
2 relevant information with regard to the operation of the mobile phone handset.

3 The memory **104** typically has stored therein a user preference/configuration
4 information of the particular handset. The memory **104** may also have stored thereon a
5 telephone directory, which may include, *inter alia*, *e.g.*, phone numbers, names or the like of
6 people, whom the user may call or receive calls from. The user typically presses various keys
7 in the user interface **103** to access the telephone directory, and is shown a display of the
8 relevant directory information in the display of the user interface. Some modern mobile
9 phone handset may even allow the user to “speed dial” the called party, corresponding
10 directory information of whom is shown in the display, without having to manually enter the
11 telephone number through the keypad.

12 The processor/control subsection **102** supervises each of the conventional components
13 to carry out the proper operation of the handset, and may include one or more
14 microprocessors and computer programs.

15 In accordance with an embodiment of the present invention, the mobile phone handset
16 **100**, in addition to the above described conventional mobile phone components, may further
17 comprise a POT line connector **108**, which may be, *e.g.*, a RJ-11 type connector or the like
18 typically used in POT line connections, and known to those familiar with telephone line
19 connections, to provide the handset **100** with a capability to connect to a POT line. The
20 mobile phone handset **100** may also include a POT transmitter/receiver circuitry (POT Tx/Rx
21 Circuitry) **107** that converts electrical signals received from the telephone subsection **101** to
22 modulated signals suitable for transmitting over a POT line, and that converts signal received
23 from the POT line into electrical signal that the telephone subsection **101** can recognize. The
24 POT Tx/Rx Circuitry **107** may be of the kind that is typically included in a POT devices, and
25 which is known to those familiar with the workings of plain ordinary telephones.

26 The mobile phone handset **100** further comprises a line detector **110** which detects
27 whether the POT line connector **108** is connected to a POT line, by for example, detecting the
28 presence of signals being received by the POT line connector **108** from the POT line, if any.

1 In accordance with this exemplary embodiment, when the line detector **110** detects the
2 presence of POT line connection, the line detector **110** sends a "POT_Line_Present" signal to
3 the processor /control subsection **102**, which is modified to include functions, which may be
4 implemented as software, hardware or a combination thereof, for causing the telephone
5 subsection **101** to send telephone call related electrical signals to, and receive signals from,
6 the POT Tx/Rx circuitry **107**, rather than the RF subsection **105** when the POT_Line_Present
7 signal is received.

8 In this example, when the user initiates a telephone call using the mobile phone
9 handset **100**, the call is made through the POT line (if the handset **100** is connected to the
10 POT line) to take advantage of the lower POT line rate. Even when the call is being made
11 over a POT line, the user is allowed to utilize every feature of the handset **100**, *e.g.*, directory
12 access, speed dialing and the like.

13 Fig. 1A shows an alternative exemplary embodiment of the mobile telephone handset
14 **100A**, capable of connecting to a local area network (LAN), *e.g.*, an Ethernet network, and
15 which comprises each of the conventional mobile phone components described above --
16 namely a telephone subsection **101**, a RF subsection **105**, a Tx/Rx subsection **106**, a user
17 interface **103**, a storage memory **104**--, a modified processor/control subsection **102** and a
18 line detector **110** as previously described. The line detector **110** of this embodiment sends a
19 "LAN_Connection_Present" signal to the processor control subsection **102** upon detection of
20 signals being received by the LAN connector **111**.

21 In addition, the mobile phone handset **100A** further includes a LAN connector **111**,
22 which may be for example, a RJ-45 type connector for connecting to an Ethernet network as
23 known to those familiar with LAN connections, and a network controller **112** that allows the
24 processor/control subsection **102** to communicate with other computing device connected to
25 the LAN. The network controller **112** may be an Ethernet controller, which is well known to
26 those familiar with network connections.

27 In this example, the processor/control subsection **102** includes additional functions,
28 which may be implemented as software, hardware or a combination thereof, for allowing the

1 user to access the LAN using the user interface **103** when the handset **100B** is connected to a
2 LAN via the LAN connector **111**. For example, a user interface screen may be displayed to
3 the user on the display device of the user interface **103**, allowing the user to select, *e.g.*, by
4 pressing one or more keys on the keypad of the user interface **103**, various tasks to be
5 performed over the LAN, *e.g.*, reading and/or composing e-mail messages over the LAN, to
6 cause the telephone directory stored in the memory **104** to be printed at a networked printer
7 connected to the LAN, access wide area networks (WAN), *e.g.*, the Internet, via the LAN, or
8 the like.

9 Fig. 1B shows another alternative exemplary embodiment of the mobile telephone
10 handset **100B**, capable of connecting to a LAN and/or a POT line. As shown, the mobile
11 phone handset **100B** comprises both a LAN connector **111** and a POT line connector **108**,
12 each of which was previously described. The mobile phone handset **100B** also comprises a
13 network controller **112** and a POT Tx/Rx circuitry **107**, which were also previously
14 described. In this example, the line detector **110** detects the presence of signals being
15 received by both the LAN connector **111** and the POT line connector **108**, and sends the POT
16 Line_Present signal and/or the LAN_Connection_Present signal, as appropriate, and as
17 previously described. The mobile phone handset **100B** allows a user to make calls over a
18 POT line and/or to access a LAN using the user interface **103** of the handset.

19 Fig. 1C shows yet another alternative exemplary embodiment of the mobile phone
20 handset **100C**, capable of connecting to a LAN, to a POT line and/or to other computing
21 devices. Each of the telephone subsection **101**, RF subsection **105**, Tx/Rx subsection **106**,
22 user interface **103**, storage memory **104**, network controller **112** and the POT Tx/Rx circuitry
23 **107** shown in Fig. 1C is as previously described.

24 In this exemplary embodiment, the mobile phone handset **100C** comprises a multi-
25 purpose connection adaptor **113**, to which various telephone lines, networks and/or
26 computing devices may be connected. Fig. 2 shows a more detailed diagram of the multi-
27 purpose connection adaptor **113**, which is shown to comprise a multi-purpose connector **202**
28 and a line detector/modem/crossover unit **201**. The multi-purpose connector **202** may be,

1 *e.g.*, a RJ-45 type connector socket modified to accommodate the male plugs connectors of
2 both the RJ-11 type and the RJ-45 type. Typically, a RJ-45 type connector is physically
3 wider than a RJ-11 connector. The multi-purpose connector **202** may be the size of a RJ-45
4 connector with appropriate tabs to securely hold a RJ-11 type male plug as well as a RJ-45
5 type plug.

6 Typically, the RJ-45 type connector wiring for Ethernet network connections include
7 four wires, a pair of wires for transmission (Tx+ and Tx-) and the other pair for reception
8 (Rx+ and Rx-) of data. In order to accommodate the appropriate order of wires, *i.e.*, the
9 black, red, green and yellow as known to those familiar with POT line wiring, the line
10 detector/modem/crossover unit **201** may need to transpose some of the ordering of the Tx+,
11 Tx-, Rx+ and Rx- wires to present the correct ordering of the wires to the POT TX/Rx
12 circuitry **107**. The line detector/modem/crossover unit **201** further comprises a line detector
13 to detect the presence of signals received in the multi-purpose connector **202**, and the type of
14 signal, *i.e.*, whether the received signal is from a network device or from the POT line, by,
15 *e.g.*, detecting which of the four wires the signals are being received.

16 Referring again to Fig. 1C and 2, upon detection of signal at the multi-purpose
17 connector **202**, the line detector/modem/crossover unit **201** sends an appropriate connection
18 present signal to the processor/control subsection **102**, apprising the processor/control
19 subsection **102** whether a POT line connection or a LAN connection is present at the multi-
20 purpose connector **202**. If a POT line connection is present, the processor/control subsection
21 **102** causes the telephone subsection **101** to send all telephone related electrical signal to the
22 POT Tx/Rx circuitry **107**, allowing a user of the mobile phone handset **100C** to place a call
23 over the POT line, including the usage of the directory based speed dialing as previously
24 described. Additionally, the user may be provided with an option to access a wide area
25 network (WAN), *e.g.*, the Internet, the world-wide-web or the like, through a dial-up
26 connection over the POT line. When a user chooses to call an internet service provider (ISP)
27 over the POT line, the processor/control subsection **102** causes the modem in the line
28 detector/modem/crossover unit **201** to establish a dial-up connection to the ISP. The dial-up

1 access to the WAN may provide a less expensive alternative to a wireless access, *e.g.*, using a
2 wireless application protocol (WAP).

3 On the other hand, if a LAN connection is present, the processor/control subsection
4 **102** communicates to the connected LAN devices through the network controller **112**,
5 allowing the user of the mobile phone handset **100C** to access the LAN from the mobile
6 phone handset **100C**. For example, a user interface screen may be displayed to the user on
7 the display device of the user interface **103**, allowing the user to select, *e.g.*, by pressing one
8 or more keys on the keypad of the user interface **103**, various tasks to be performed over the
9 LAN, *e.g.*, reading and/or composing e-mail messages over the LAN, causing the telephone
10 directory stored in the memory **104** to be printed at a networked printer connected to the
11 LAN, accessing a wide area network (WAN), *e.g.*, the Internet, via the LAN or the like.

12 In addition, the mobile phone handset **100C** allows a user to communicate with
13 various computing devices, *e.g.*, a lap-top or a desktop personal computer, a personal digital
14 assistant (PDA) device, a global positioning system (GPS) device or the like, which have
15 either a network card to communicate with the mobile phone handset **100C** using a network
16 communication protocol, *e.g.*, the Ethernet protocol or the like, or a modem to communicate
17 with the mobile phone handset **100C** over the POT line connection.

18 By way of example, and not as a limitation, the capability to connect to the various
19 computing devices may enable a user of the mobile phone handset to utilize the better user
20 interface capability (*e.g.*, a larger display screen and a more convenient input devices
21 including a mouse and a larger keyboard, or the like) of the computing device, *e.g.*, when the
22 user is accessing a wide area network (WAN), *e.g.*, the Internet. A GPS device connected to
23 the mobile phone handset **100C** may enable the user to provide the exact geographical
24 location of the user to, *e.g.*, an on-line service provider, and to thus obtain a more
25 geographically relevant information when accessing a wide area network (WAN), *e.g.*, the
26 Internet, through the wireless mobile network.

27 As can be appreciated, the mobile phone handset **100C** provides very versatile
28 connection and/or operation capabilities, allowing a user to make telephone calls via a

1 wireless mobile network or over a POT line, allowing the user to access a wide area network
2 (WAN) via modem dial-up, through a local area network (LAN) or through a wireless mobile
3 network, and allowing the mobile phone handset to communicate with various computing
4 devices having either a modem or a network card.

5 Although, for brevity, the connectors **108**, **111** and **202** in the above description of
6 various embodiments of the mobile handset according to the principles of the present
7 invention are shown to be female type connectors, it should be readily apparent to those
8 skilled in the art, and should be understood that each of the connectors may be a male type
9 connector.

10 Referring to Fig. 3, an exemplary embodiment of the operation process of the mobile
11 phone handset in accordance with the principles of the present invention will now be
12 explained. The operation of the mobile phone handset (*e.g.*, any of the mobile handsets **100**,
13 **100A**, **100B** and **100C** as described above) starts at step **301**, when, *e.g.*, the mobile phone
14 handset is powered up. When the processor/control subsection **102** detects an initiation of a
15 telephone call by the user in step **302**, a determination whether a POT line connection is
16 present is made in step **303**. The determination may be made, *e.g.*, by the processor/control
17 subsection **102** from the presence of an appropriate signal from the line detector **110** (as
18 shown in Figs. 1, 1A and 1B) or the multi-purpose connection adaptor **113** (as shown in Fig.
19 1A) as previously described.

20 If it is determined that a POT line is connected to the mobile phone handset, the
21 processor/control subsection **102** causes the call request and call related electrical signals to
22 be sent from the telephone subsection **101** to the POT Tx/Rx circuitry **107** in step **305**. The
23 telephone call is then allowed to be completed over the POT line. As previously described,
24 the call may be made by the telephone directory based speed dialing feature available in the
25 mobile phone handset.

26 If, on the other hand, it is determined in step **303** that the POT line is not connected to
27 the mobile phone handset, the processor/control subsection **102** causes the call request and
28 call related electrical signals to be sent from the telephone subsection **101** to the RF

1 subsection **105** in step **304**. The telephone call is then allowed to be completed over a
2 conventional mobile phone network in the same manner as if a conventional mobile phone
3 handset is used.

4 When the user requests for a network access in step **306**, *e.g.*, by selecting the
5 network access menu selection from the user interface **103**, a determination whether a LAN
6 connection is present is made in step **307**. The determination may be made, *e.g.*, by the
7 processor/control subsection **102** from the presence of an appropriate signal from the line
8 detector **110** (as shown in Figs. 1, 1A and 1B) or the multi-purpose connection adaptor **113**
9 (as shown in Fig. 1A) as previously described.

10 If it is determined that a LAN connection is not present, the user is notified of the lack
11 of LAN connection **308**, and may be prompted to provide a connection by engaging LAN
12 cable to the connector **111** (or **202**).

13 If, on the other hand, it was determined that a LAN connection is available, in step
14 **309**, the processor/control subsection **102** communicates to the connected LAN devices
15 through the network controller **112**, allowing the user of the mobile phone handset to access
16 the LAN from the mobile phone handset, to, *e.g.*, read and/or compose e-mail messages over
17 the LAN, to access a networked printer connected to the LAN, to access wide area networks
18 (WAN) via the LAN or the like.

19 In step **310**, the processor/control subsection **102** determines whether a computing
20 device is connected to the connector (**108**, **111** or **202**), either through a modem or a network
21 card, and if a computing device is connected, then allows the user to utilize the user interface
22 of the computing device in step **311**. The process **300** then returns to step **302**, and repeats
23 the steps **302** through **311**.

24 Although, in the above description, the various embodiments of the mobile phone
25 handset in accordance with the principles of the present invention are described using
26 examples in which a user is allowed to place a call either through a wireless communication
27 network or through a POT line, it should be understood and readily apparent to those skilled

1 in the art that the user may receive a call from another caller either through the wireless
2 network or a POT line.

3 In particular, when a call is received through the POT line (*i.e.*, while the mobile
4 phone handset is connected to the POT line), the call related signals from the POT line are
5 received by the POT Tx/Rx circuitry **107**, which in turn produces and sends the
6 corresponding electrical signals to the telephone subsection **101**, which, under control of the
7 processor/control subsection **102**, produces the ring and enables the user of the mobile phone
8 handset to hear the caller's voice. In an embodiment of the present invention, the
9 processor/control subsection **102** causes the caller identification (caller ID) information
10 typically included in the call related signals on the display screen of the user interface **103**. In
11 a preferred embodiment, the processor/control subsection **102** may search the telephone
12 directory stored in the memory **104** to find the caller's name corresponding to the telephone
13 number included in the caller ID information, and if a matching name is found in the
14 telephone directory, displays the name of the caller on the display screen of the user interface
15 **103**.

16 As can be appreciated, the above described mobile phone handset and methods
17 provide versatile ways in which telephone calls may be made and/or received, and
18 capabilities to communicate with various computing devices and networks.

19 While the invention has been described with reference to the exemplary embodiments
20 thereof, those skilled in the art will be able to make various modifications to the described
21 embodiments of the invention without departing from the true spirit and scope of the
22 invention. The terms and descriptions used herein are set forth by way of illustration only
23 and are not meant as limitations. In particular, although the method of the present invention
24 has been described by examples, the steps of the method may be performed in a different
25 order than illustrated or simultaneously. Those skilled in the art will recognize that these and
26 other variations are possible within the spirit and scope of the invention as defined in the
27 following claims and their equivalents.